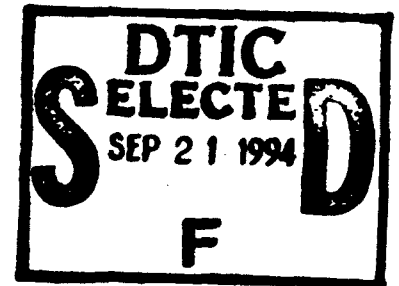


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CSC

ALTERNATIVE MAINTENANCE STUDY (II)

FOR THE

QUICK RESPONSE MULTICOLOR PRINTER SYSTEM

UNITED STATES ARMY TOPOGRAPHIC ENGINEERING CENTER

FORT BELVOIR, VIRGINIA

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MULTICOLOR PRINTER SYSTEM (QRMP System)

David S. Campbell

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1994

USATEC

United States Army

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MULTICOLOR PRINTER SYSTEM (QRMP System)

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August 1994

Contract DACA76-91-D-0002

Prepared for

USATEC

United States Army

Topographic Engineering Center

Graphic Systems Division

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Abstract

The purpose of this study is to perform an analysis of maintenance alternatives for the QRMP System Commercial-Off-The-Self, Non-Developmental-Items to determine which maintenance method will be the most cost effective and advantageous to the Government.

The analysis included an evaluation of Contractor Logistics Support (CLS), the Army standard four-level maintenance system, and combinations thereof. Military standard items maintained by the Army maintenance system (ISO shelter, generator, vehicle, etc.) are not included in the study.

Interim contractor support (ICS) is an option to use in the transitional short-term. ICS was not evaluated for long-term support.

The U.S. Army has an electronics maintainer presently performing maintenance on similar types of equipment. This precludes the need for initiating a new maintainer although the maintenance training on the QRMP components would have to be added to this maintainer's inventory of components he or she repairs.

The QRMP is a battlefield system that would require support in battlefield conditions. This requirement could be a detriment to the QRMP operations if support cannot be provided in all instances.

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Summary

The maintenance cost estimate results for the QRMP COTS Printer and Scanner show that total CLS is the most cost effective Maintenance support solution by approximately \$31K per year.

The U.S. Army will be risking battlefield support if a contractor is chosen to provide unit, direct, or general maintenance support for the QRMP.

The U.S. Army has the technical capability and support to provide maintenance to the QRMP COTS equipment on the battlefield.

The report recommends that a contractor provide Interim Contractor Support until organic support is implemented.

The implementation of the organic support consisting of operator/crew Preventive Maintenance Checks and Services (PMCS) performed by the 81-Q MOS, direct support maintenance performed by the 29-J (35-J) MOS, and depot support maintenance (reparable components) performed by the original equipment manufacturers.

In addition, the role of the 29-J (35-J) in systems maintenance should be expanded to include any other electronic information processing systems that are typically widely dispersed, non-maintenance intensive, Commercial-Off-The-Shelf or Army developed. These systems could include the digitizer and printer in the Digital Topographic Support System (DTSS) and the CHS-II components.

1.0 Introduction

1.1 Subject.

The subject of this study is the Quick Response Multi-Color Printer (QRMP) system Commercial-Off-The-Shelf (COTS) color printer and flatbed color scanner.

1.2 Purpose.

The purpose of this study is to perform an analysis of maintenance alternatives for the QRMP COTS items to determine which maintenance method will be the most cost effective and advantageous to the Government.

1.3 Scope.

The analysis will include an evaluation of Contractor Logistics Support (CLS), the Army standard four-level maintenance system, and combinations thereof. Military standard items maintained by the Army maintenance system (ISO shelter, generator, vehicle, etc.) and the computer equipment from the Common Hardware/Software II program are not included in the study because maintenance solutions for these items have been identified.

1.4 Organization.

This report is organized and presented in accordance with American National Standard Z39.18-1987, "Scientific and Technical Reports -Organization, Preparation, and Production."

2.0 Methods, Assumptions, and Procedures

2.1 Methods.

- a. An examination was made of the Army electronics maintainers to identify possible candidates for maintaining the COTS equipment in the organic maintenance environment.
- b. A site visit to the scanner manufacturer was conducted in order to qualify the maintenance procedures performed on the scanner and to ascertain the quality of commercial maintenance manuals.
- c. Since a printer was available at the Topographic Engineering Center (TEC), a meeting was arranged with a printer maintenance engineer at TEC to qualify the maintenance procedures performed on the printer and to ascertain the quality of commercial maintenance manuals.
- d. The findings from the research in b. and c. above were evaluated in concert with the procedures of the Army maintenance system to develop possible organic maintenance concept for the COTS equipment.
- e. The Army cost analysis manual was used to develop a maintenance cost comparison between organic maintenance and contractor maintenance.

2.2 Assumptions.

2.2.1 Repair/Spare Parts.

The QRMP is subject to periodic technological upgrade. Every five or so years a better peripheral component may be acquired to enhance the QRMP's capabilities or products. Even though the present vendors can be queried for parts supply support, this does not reflect on future vendors capability to supply parts. This report will assume present and future vendors will supply parts or in the event they cannot supply parts, the Government will not procure their products. The system must be supportable.

2.2.2 Installation of COTS Equipment.

This report will assume that the COTS equipment will be mounted within the shelter in such a manner as to allow all maintenance procedures to be performed in an efficient manner.

2.3 Procedures. Not applicable for this study.

3.0 Results and Discussion

3.1 Factors List.

Factors that contribute to the QRMP maintenance solution are:

- a. Battlefield deployment
- b. Army maintenance policies,
- c. Non-developmental/Commercial-Off-The-Shelf items,
- d. Quantity of QRMP systems,
- e. Geographical stationing of QRMP Systems,
- f. Estimated cost of maintenance for the QRMP, and
- g. Organic/Contractor maintenance ability.

3.1.1 Battlefield Deployment.

There are two basic choices for maintenance of a system used by the military, organic support and contractor support. There are combinations of these two support options which involve dividing up the levels of support between the two. Every support option has positive and negative attributes as far as effectiveness and cost. Sometimes a trade-off must be determined between effectiveness and cost to achieve maximum availability of the system.

The primary mission of the QRMP is to support the battlefield commander with topographic products. The maintenance analysis foremost operational scenario is the "go to war" situation where maintenance in the battle environment must be provided to support the system's operations. A system used in a battle environment should have maintenance support that can function in a battle environment. If the maintenance support cannot function where the system is used, the system will ultimately fail to support its users.

As with most military systems, the primary consideration for maintenance of the QRMP is operational stationing. Maintaining a system on the battlefield will have different requirements than a system used in an office building. The system used in an office building will have a stable environment and probably will not experience battle conditions. The system used on the battlefield will not have a stable environment and

maintenance personnel will be exposed to other than ideal conditions. For the QRMP to be an effective tool for the battlefield commander, the QRMP must be supported on the battlefield.

3.1.2 Army Maintenance Policies

AR 750-1 establishes the policies for the maintenance of Army material at the unit, Direct Support (DS), and General Support (GS) levels of the Army maintenance system. With concern to the QRMP and its requirement to operate at Echelons Above Corps (EAC), Corps, Division and possibly separate Brigade levels in a combat environment, the following excerpts were extracted from AR 750-1 (dated November 1992).

"3-1. General Maintenance Policies"

"i. Maintenance will be performed by military personnel in areas forward of the corps rear boundary. Contractors and contracted maintenance will not normally be allowed for unit or DS levels of maintenance. It is the intent of Army policy that equipment issued to troops in TOE units be maintained by soldiers at unit and DS levels. Exceptions to this policy will be approved by HQDA. Contractor maintenance personnel will not be permanently stationed forward of the corps rear boundary. Contractor maintenance personnel may travel forward of the corps rear boundary on a case-by-case basis as individual equipment failures occur to provide temporary on-site maintenance. Behind the corps rear boundary, in addition to military personnel, civilian maintenance personnel (contract, TDA, local nationals, and so forth) may be acceptable as a prudent risk on the probability of maintenance services being continued in wartime."

"Section IV"

"Contract Maintenance Support"

"4-22. Private Enterprise"

When the Army maintenance system cannot provide required support, the Army will rely on the competitive private enterprise system, both domestic and foreign."

"4-23. Prohibitions and Restrictions"

a. Prohibitions.

Maintenance by contract personnel is prohibited when:

- (1) The maintenance workload to be performed is necessary for individual and unit training.
- (2) A satisfactory commercial source is not available and cannot be developed in time to provide maintenance support when needed.
- (3) Contract maintenance support will result in higher cost of maintenance support to the Army.
- (4) The product of service is available from another DoD component or another federal agency.

b. Restrictions.

- (1) Contractor maintenance personnel may not be permanently stationed forward of the corps rear boundary.
- (2) Contractor maintenance personnel may travel forward of the Corps rear boundary on a case-by-case basis as individual equipment failures occur to provide temporary on-site maintenance."

It is evident that Army policy provides for the use of organic maintenance whenever possible and when organic maintenance cannot provide support, contractor support shall be utilized.

3.1.3 Non-developmental/Commercial-Off-The-Shelf Items.

The QRMP COTS equipment is comprised of a color printer and color scanner. These units are subject to technological obsolescence with the year-to-year exponential advances in digital data processor design and mechanical design.

It is because of this technical growth, one must consider the economical feasibility of obligating the Government in providing certain levels of maintenance resources for support. Just when the support system has reached full capability, the product becomes outdated. The new COTS-NDI item is procured and again the support system is re-initiated. With COTS-NDI, this process could go on forever, never assuming a state of efficiency. A decision has to be made to identify what areas are better supported by organic maintenance and what areas are better supported by a contractor. Because the system components may have an approximate five year turnover and are probably composed of proprietary parts, repair of LRUs or modules at certain maintenance levels by the Government could be cost-prohibitive. It would be cost-effective to let the vendors repair their own parts since they are doing so already.

3.1.4 Quantity of QRMP Systems.

In consideration of the quantity of systems, quantity by itself is not enough to make any determination of a support solution. The location of the system(s) in conjunction with quantity of systems will provide a more sound justification for support concepts. A single one-of-a-kind system permanently located at one CONUS site would have strong economic justification for contractor support. A dozen or more battle-support systems located world-wide may have a stronger operational justification for organic support.

3.1.5 Geographical Stationing of QRMP Systems.

The QRMP System will be stationed in Europe, the Far-East, Hawaii, and in the United States. Maintenance must be available and fully functional at all these locations. If organic maintenance is used then maintenance support will be available wherever the system is used, garrison and field. Contractors do provide maintenance at these various locations but would the contractor support move with the system when the system was deployed to the field on exercises or to a foreign country in time of conflict?

The organic structure is more deft to constant movement than the contractor. Contractors have gone and usually will go with the systems they support but, if there is an extremely adverse environment where the battle is occurring, there is no guarantee the system will be supported. The battlefield is not the place to discover a lack of support.

3.1.6 Organic/Contractor Maintenance Ability.

The QRMP is an integrated system comprised of components from various vendors. The system has been integrated by a Government R&D organization and only this organization at this time has the knowledge to repair it as a whole, with the assistance of vendor technicians maintaining individual sub-systems. Upon fielding of the complete system, organic and contractor maintainers would experience a learning curve from the beginning. There is no clear advantage or disadvantage in this area.

3.2 Operator/DS-GS Maintainer Considerations.

The 81-Q enlisted MOS has been nominated to operate and provide operator PMCS maintenance for the QRMP. The 81-Q could be trained to repair the QRMP at the DS/GS level. The benefits of having the 81-Q maintain the system at DS/GS levels are:

- a. The repair person is collocated with the equipment, and
- b. The equipment downtime would be reduced.

The disadvantages of having the 81-Q maintain the system at DS/GS levels are:

- a. Adding the necessary electronics training to the topographics training,
- b. Lack of space within the ISO shelter for tools and test equipment,
- c. Reduced productive time in unit because of the extended training time, and
- d. The QRMP is not maintenance intensive rather it requires operators to operate it to provide products.

Given the limited quantity, various world-wide locations, and extended service life of the QRMP, the best maintainer would be one that is located at DISCOMS and COSCOMS and one that is trained on other systems so that the maintainer does not become idle. An operator/DS-GS maintainer combination would work well when the subject system performs its mission with very little operator intervention and much attention to maintenance. This is not the case with the QRMP.

3.3 Review of Army Enlisted Maintenance MOSs.

Part of the effort towards developing a maintenance solution is identifying organic maintenance personnel who are currently performing similar maintenance on similar types of equipment. AR 601-211 presents the 29-J, Telecommunications Terminal Device Repairer, is currently trained to provide DS/GS maintenance on teletypewriters, reperforators, facsimile equipment, computer terminals, and associated devices. The 29-J provides many benefits; a new maintenance MOS does not have to be created for the QRMP, the 29-J already receives the necessary basic electronics training for this type of equipment, the 29-J is stationed at DISCOMS and COSCOMS, and the QRMP COTS components could be added to the 29-J's repertoire of equipment to maintain. The 29-J will be redesignated as MOS 35-J in June 1995 per an enlisted force structure change. The 35-J will perform the same functions as the old 29-J with the exception of teletypewriter maintenance. Throughout this document, the 29-J will be referenced by the following: 29-J (35-J).

3.4 Common Hardware/Software II.

The CHS-II computer equipment will be integrated into the QRMP. The CHS-II has been designed to need unit and depot level maintenance only. The nominated unit level maintainer for the CHS-II is the enlisted 31-U MOS. Since the units gaining the QRMP System will probably have the 31-U MOS, a local maintainer will be available if the CHS-II within the QRMP needs repair. The CHS-II within the QRMP is an integral part of the QRMP and the 31-U may not be able to repair a CHS-II fault caused by the fileserver or other associated equipment.

A situation arises where there are two categories of equipment (CHS, Peripherals) and a different maintainer for each. Scenario: The printer will not print. Is the problem the CHS or the printer? Who does the operator call first; the 31 U or the 29 J (35-J)? This situation is remedied by having a good operator manual that addresses these types of situations. The 31-U and the 29-J (35-J) will work in concert.

3.5 Army 4-Level Maintenance.

Unit Level Maintenance. The only unit level maintenance identified for the COTS equipment is operator Preventive Maintenance Checks and Services (PMCS). For the Printer this will include replacement of paper and ink pens/cartridges. For the Scanner this will include replacement of the scanning light bulb. There are no organizational mechanic/technician unit-level maintenance tasks identified.

Direct Support Maintenance. The direct support maintenance tasks identified for the COTS equipment include: troubleshooting malfunctions, alignment of mechanical assemblies and electronics, replacement of printed circuit boards, wiring, connectors, mechanical parts, and equipment upgrades within the capabilities of direct support.

General Support Maintenance. There are no general support maintenance tasks identified.

Depot Support. The depot level support for the COTS equipment include supply and transportation transactions by an organic depot. Depot level repair for individual COTS equipment should be made by the original equipment manufacturer.

3.6 Estimated Cost of Maintenance.

The guide for developing the cost of maintenance estimate for the QRMP was the Cost Analysis Manual from the U.S. Army Cost and Economic Analysis Center. This manual provides a standard cost estimating methodology for Baseline Cost Estimates including contractor and organic maintenance support.

The cost estimate is based on peace time usage. Using war time usage for the cost estimate would cause the cost estimate to reflect a higher annual usage than what will be actually experienced. The use of the QRMP in wartime will greatly escalate the cost of maintenance because of the increase in product demand. Since it is impossible to forecast when and how long future conflicts will occur, the peace time estimate is the most realistic choice for the cost estimate.

The following data was obtained from the manufacturers to be used as input to the estimated cost for maintenance.

	Printer	Scanner
Mean Time To Repair	2 Hours	15 Min.
Mean Time Between Failure	3120 Hours	900 Hours
Commercial Maintenance Cost	6.6%/Year	13.2 %/Year
Unit Cost	\$9,995.00	\$75,525.00
Warranty	1 Year	90 Days
Weight	155 lbs.	200 lbs.

3.6.1 Annual Operating Hours.

The Annual Operating Hours (AOH) were estimated by CSC and approved by USATEC. The AOH estimate was achieved by considering:

- a. on the low usage side, some units will not have an every day or week or month demand for products thus they may not even power-up the QRMP, and
- b. some units will work with the QRMP and only occasionally produce a product,
- c. on the high usage side, some units (like the 555 Eng. Co., III Corps, Ft. Hood, TX.) produce products eight hours a day for a majority of the year, and
- d. war time demand for products could reach 16-24 hours a day.

From these concerns, the best mean figure for AOH is 2080 hours.

3.6.2 Maintenance and Parts Percentages.

The cost cells require a division of the commercial maintenance cost. The commercial maintenance cost is a percentage of the cost of the unit. These percentages are provided by the manufacturers. Because the percentages have changed, the report will present the percentage break-out from the last maintenance study (3.6.2.1) and then new break-outs for the new commercial maintenance percentages (3.6.2.2 & 3.6.2.3).

3.6.2.1 Old Commercial Maintenance Percentage Break-Out.

12 % (Total Commercial Maintenance) equals:

6% (Labor/Management) equals:

- 5% (Labor/Management below depot level)
- 1% (Labor/Management at depot level)

6% (Parts) equals:

- 2.5% (Consumables)
- 2.5% (Repairables)
- 1.0% (Depot Material Parts)

3.6.2.2 Printer Commercial Maintenance Percentage Break-Out.

6.6 % (Total Commercial Maintenance) equals:

3.3% (Labor/Management) equals:

- 2.77% (Labor/Management below depot level)
- 0.53% (Labor/Management at depot level)

3.3% (Parts) equals:

- 1.385% (Consumables)
- 1.385% (Repairables)
- 0.53% (Depot Material Parts)

3.6.2.3 Scanner Commercial Maintenance Percentage Break-Out.

13.2 % (Total Commercial Maintenance) equals:

6.6% (Labor/Management) equals:

5.54% (Labor/Management below depot level)

1.06% (Labor/Management at depot level)

6.6% (Parts) equals:

2.77% (Consumables)

2.77% (Repairables)

1.06% (Depot Material Parts)

3.6.3 CLS vs Organic Parts.

The individual vendor will be supplying parts whether the supply was for CLS support or to Organic support. Because the parts vendor is supplying the same parts to the same machines, these parts would carry the same cost, profit, overhead and G&A no matter which maintenance method was chosen.

3.6.4 Presentation of Maintenance Cost Estimate.

Table 1.0 presents the five possible maintenance options for the QRMP relative to the Army four-level maintenance system. The five maintenance options shown are all combinations of CLS and Organic support. This matrix provides an over view of which cost elements in the Cost Analysis Manual are applied to each maintenance option. Maintenance Option 3 is not a choice to be considered because some of the Cost Analysis Guide cost elements do not allow a division between Direct Support and General Support.

After Table 1.0, the Cost Analysis Guide cost elements are presented. Each cost element provides assumptions, a definition of the element, sources of data, a cost equation or equations, calculations using the equations and source data, and results.

After the cost elements, the Cost Analysis Guide cost summaries are presented. The cost summaries reiterate the results from the cost elements and provide a total cost for each maintenance option.

After the cost summaries, Table 2.0 is presented. Table 2.0 presents the totals from the cost summaries as they are related to the maintenance options for comparison.

3.6.4.1 Cost Element Comments.

Realistically there will not be a need for General Support for the QRMP when considering the definition and mission of General Support as defined by AR 750-1. In the present configuration, the QRMP will not have Unit-Level maintenance repairs although operator/crew preventive maintenance checks and services (PMCS) will be required. Operator/crew PMCS is defined as a part of Unit-Level maintenance in AR 750-1. The 5 year operational life was chosen because of technological obsolescence; not capability or durability of the system. The entire system may be around for 10-20 years with equipment upgrades approximately every five years.

Option 1	Option 2	Option 3	Option 4	Option 5	
Organic	CLS	CLS	CLS	CLS	Depot Support
Organic	Organic	CLS	CLS	CLS	General Support
Organic	Organic	Organic	CLS	CLS	Direct Support
Organic	Organic	Organic	Organic	CLS	Unit Support
2.11	2.11	2.11	2.11		Training Ammunition/Missiles
4.02	4.02	4.02	4.02		Maintenance (MTOE)
4.051	4.051	4.051	4.051		Training (MP Funded)
		5.01	5.01	5.01	Field Maintenance Civilian Labor
5.03	5.03	5.03	5.03	5.03	Replenish Depot Level Repairables
5.04	5.04	5.04	5.04	5.04	Replenishment Consumables
5.061	5.061				Overhaul (P7M)
5.07	5.07	5.07	5.07	5.07	Transportation
5.101	5.101	5.101	5.101	5.101	Project Management Administration
5.11	5.11	5.11	5.11		Training (O&M Funded)

TABLE 1.0 QRMP Maintenance Option Matrix

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP

ELEMENT TITLE: TRAINING AMMUNITION/MISSILES

DATE: 26 JULY 1994

ELEMENT NUMBER: 2.11

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. The 29J E4 OPA replacement training cost is \$639.52 (Constant 93\$).
- c. The 29J E5 OPA replacement training cost is \$639.52 (Constant 93\$).
- d. The average replacement training cost is \$639.52 (Constant 93\$).
- e. $\$639.52 * (1.028 \text{ OPA Inflation Factor}) = \$657.43 \text{ (Constant 95\$)}$.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the costs of ammunition consumed by the organic maintainer during both unit training and annual services practice.
- b. This element excludes the MP associated with replacement training and the O&M funded training services costs.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Replacement Training Cost - AMCOS MODEL, Version 7.0, Dated June 1993.
- d. Annual Maintenance Ratio - From Cell 4.02 calculations.
- e. Number of Systems - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Annual Maintainer's Replacement Training Cost} * \\ & \quad \text{Annual Maintenance Ratio} * \\ & \quad \text{Number of Systems} = \\ & \text{Annual Cost of Training Ammunition (Constant FY95\$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Option 1 & 2

$$\begin{aligned} & \$657.43 \text{ Average Replacement Training Cost} * \\ & \quad 0.28 \text{ Annual Maintenance Ratio} * \\ & \quad 2 \text{ Systems} = \\ & \$368.16 \text{ Annual Cost of Training Ammunition (Constant 95\$)} \end{aligned}$$

Option 3

$$\begin{aligned} & \$657.43 \text{ Average Replacement Training Cost} * \\ & \quad 0.22 \text{ Annual Maintenance Ratio} * \\ & \quad 2 \text{ Systems} = \\ & \$289.27 \text{ Annual Cost of Training Ammunition (Constant 95\$)} \end{aligned}$$

Option 4

\$657.43 Average Replacement Training Cost *

0.15 Annual Maintenance Ratio *

2 Systems =

\$197.23 Annual Cost of Training Ammunition (Constant 95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Option 1 & 2	\$368.16	\$368.16	\$368.16	\$368.16	\$368.16	\$1,840.80
Option 3	\$289.27	\$289.27	\$289.27	\$289.27	\$289.27	\$1,446.35
Option 4	\$197.23	\$197.23	\$197.23	\$197.23	\$197.23	\$986.15

9. TOTAL.

Option 1 & 2 \$1,840.80 (Constant 95\$)

Option 3 \$1,446.35 (Constant 95\$)

Option 4 \$986.15 (Constant 95\$)

Option 5 Does not apply.

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP

ELEMENT TITLE: MAINTENANCE (MTOE)

DATE: 26 JULY 1994

ELEMENT NUMBER: 4.02

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. The 29J E4 total basic pay and allowances cost is \$26,685.00 (Constant 93\$).
- d. The 29J E5 total basic pay and allowances cost is \$32,745.00 (Constant 93\$).
- e. The average total basic pay and allowances cost is \$29,715.00 (Constant 93\$).
- f. The E4/E5 total permanent change of station costs are \$1812.00 (Constant 94\$).
- g. The estimated annual operational hours are 2080 hours per year.
- h. The average military man hours in man-years.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the costs of base pay and allowance, theater costs, and special pay of those direct and general support military personnel below depot level whose primary function is to maintain the materiel system being costed.
- b. This element excludes the costs of those persons whose primary function is to maintain other equipment in the force unit such as trucks and switchboards.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation- AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Maintenance Ratio Per Hour - QRMP Operational Requirements Document, RAM Rationale Executive Summary, Dated March 1992.
- d. Number of QRMPs - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- e. Annual Operating Hours - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.
- f. Maintenance Pay and Allowances - Memorandum: Military Pay Rates in Baseline Cost Estimates, dated March 1994.
- g. Permanent Change of Station - Memorandum: Military Pay Rates in Baseline Cost Estimates, dated March 1994.
- h. Average Military Man-Hours in Military -Year - Fort Belvoir Cost Analysis Division

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Average Total Basic Pay and Allowances} + \\ & \text{Total Permanent Change of Station Costs} * \\ & \text{MPA Inflation Factor 1.028 (Constant 95$)} * \\ & \text{Annual Maintenance Ratio} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Maintenance (MTOE) (Constant FY95$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Calculate Annual Maintenance Ratio Per QRMP

Option 1 & 2

2080 Annual Operating Hours * 0.12 (ORG) Maintenance Ratio = 250 Man-Hours/Year
2080 Annual Operating Hours * 0.064 (DS) Maintenance Ratio = 133 Man-Hours/Year
2080 Annual Operating Hours * 0.047 (GS) Maintenance Ratio = 98 Man-Hours/Year

250 + 133 + 98 = 481 Total Annual Man-Hours

481 Total Annual Man-Hours /
1740 Average Military Man-Hours in Military Man-Years =
Annual Maintenance Ratio 0.28

Option 3

2080 Annual Operating Hours * 0.12 (ORG) Maintenance Ratio = 250 Man-Hours/Year
2080 Annual Operating Hours * 0.064 (DS) Maintenance Ratio = 133 Man-Hours/Year

250 + 133 = 383 Total Annual Man-Hours

383 Total Annual Man-Hours /
1740 Average Military Man-Hours in Military Man-Years =
Annual Maintenance Ratio 0.22

Option 4

2080 Annual Operating Hours * 0.12 (ORG) Maintenance Ratio = 250 Man-Hours/Year

250 Total Annual Man-Hours /
1740 Average Military Man-Hours in Military Man-Years =
Annual Maintenance Ratio 0.15

Final Cell Calculations.

Option 1 & 2

\$29,715.00 Average Total Basic Pay and Allowances +
\$1,812.00 Total Permanent Change of Station Costs *
1.028 MPA Inflation Factor *
0.28 Annual Maintenance Ratio *
2 Systems =
\$18,149.46 Annual Cost of Maintenance (MTOE)(Constant 95\$)

Option 3

\$29,715.00 Average Total Basic Pay and Allowances +
\$1,812.00 Total Permanent Change of Station Costs *
1.028 MPA Inflation Factor *
0.22 Annual Maintenance Ratio *
2 Systems =
\$14,260.29 Annual Cost of Maintenance (MTOE)(Constant 95\$)

Option 4

\$29,715.00 Average Total Basic Pay and Allowances +
\$1,812.00 Total Permanent Change of Station Costs *
1.028 MPA Inflation Factor *
0.15 Maintenance Ratio *
2 Systems =
\$9,722.93 Annual Cost of Maintenance (MTOE)(Constant 95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (CONSTANT FY95 DOLLARS).

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Option 1 & 2	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$90,747.30
Option 3	\$14,260.29	\$14,260.29	\$14,260.29	\$14,260.29	\$14,260.29	\$71,301.45
Option 4	\$9,722.93	\$9,722.93	\$9,722.93	\$9,722.93	\$9,722.93	\$48,614.65

9. TOTAL.

Options 1 & 2	\$90,747.30 (Constant 95\$)
Option 3	\$71,301.45 (Constant 95\$)
Option 4	\$48,614.65 (Constant 95\$)
Option 5	Does not apply.

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP

ELEMENT TITLE: TRAINING

DATE: 26 JULY 1994

ELEMENT NUMBER: 4.051

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. The 29J E4 MPA replacement training cost = \$18,962.00 (Current 93\$).
- c. The 29J E5 MPA replacement training cost = \$18,962.00 (Current 93\$).
- d. The average replacement training cost = \$18,962.00 (Current 93\$).
- e. $\$18,962.00 * (1.028 \text{ MPA Inflation Factor}) = \$19,492.94$ (Constant 95\$).

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the MP funded costs of all pay and allowances for the system specific replacement personnel undergoing formal training for future assignment to the given materiel system. It also includes the pay and allowances of the instructors for the replacement personnel training.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation- AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Replacement Training Cost - AMCOS Model, Version 7.0, Dated June 93.
- d. Annual Maintenance Ratio - Cell 4.02.
- e. Number of Systems - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Annual Maintainer's Replacement Training Cost} * \\ & \quad \text{Annual Maintenance Ratio} * \\ & \quad \text{Number of Systems} = \\ & \text{Annual Replacement Training Cost (Constant 95\$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Option 1 & 2

$$\begin{aligned} & \$19,492.94 \text{ Average Replacement Training Cost} * \\ & \quad 0.28 \text{ Annual Maintenance Ratio} * \\ & \quad 2 \text{ systems} = \\ & \$10,916.05 \text{ Annual Replacement Training Cost (Constant 95\$)} \end{aligned}$$

Option 3

$$\begin{aligned} & \$19,492.94 \text{ Average Replacement Training Cost} * \\ & \quad 0.22 \text{ Annual Maintenance Ratio} * \\ & \quad 2 \text{ systems} * \\ & \$8,576.89 \text{ Annual Replacement Training Cost (Constant 95\$)} \end{aligned}$$

Option 4

\$19,492.94 Average Replacement Training Cost *

0.15 Annual Maintenance Ratio *

2 systems *

\$5,847.88 Annual Replacement Training Cost (Constant 95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (CONSTANT FY95 DOLLARS).

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Option 1 & 2	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$54,580.25
Option 3	\$8,576.89	\$8,576.89	\$8,576.89	\$8,576.89	\$8,576.89	\$42,884.45
Option 4	\$5,847.88	\$5,847.88	\$5,847.88	\$5,847.88	\$5,847.88	\$29,239.41

9. TOTAL.

Options 1 & 2	54,580.25 (Constant 95\$)
Option 3	\$42,884.45 (Constant 95\$)
Option 4	\$29,239.41 (Constant 95\$)
Option 5	Does not apply.

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP

ELEMENT TITLE: FIELD MAINTENANCE CIVILIAN LABOR

DATE: 26 JULY 1994

ELEMENT NUMBER: 5.01

2. ASSUMPTIONS.

a. Five year operational life of the COTS components.

b. Civilian labor percentage (from paragraph 3.6.2.1).

Printer 2.77%

Scanner 5.54%

c. The unit costs are in current FY94 dollars.

d. The warranty costs are included as part of the COTS unit cost. The printer warranty is one year. The scanner warranty is 90 days.

3. INCLUSION/EXCLUSION CRITERIA.

a. This element includes the costs of civilian maintenance labor at any level below depot maintenance. It includes contractor performed DS/GS Maintenance costs.

b. This element excludes civilian labor at the depot.

4. DATA SOURCE AND DATA ADJUSTMENTS.

a. Inflation - AMC Inflation Guidance dated 7 Feb 94.

b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.

c. Percent Maintenance Agreement Used for Labor/Managerial - See 3.6.2.1.

d. Unit Costs - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

a. Equation:

$$\begin{aligned} & \text{Unit Cost *} \\ & \text{Field Maintenance Civilian Labor Percentage of Maintenance Agreement *} \\ & \text{Number of Systems *} \\ & 1.028 \text{ Constant FY95 Inflation Factor} = \\ & \text{Annual Cost of Field Maintenance Civilian Labor (Constant FY95\$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Printer

$$\begin{aligned} & \$9,995.00 \text{ Unit Cost *} \\ & 0.0277 \text{ Civilian Labor Percentage *} \\ & 2 \text{ Systems *} \\ & 1.028 \text{ Constant FY95 Inflation Factor} = \\ & \$569.23 \text{ Annual Cost of Printer Field Maintenance Civilian Labor (Constant FY95\$)} \end{aligned}$$

Scanner

\$75,525.00 Unit Cost *
0.0554 Civilian Labor Percentage *
2 Systems *
1.028 Constant FY95 Inflation Factor =
\$8,602.48 Annual Cost of Field Maintenance Civilian Labor (Constant FY95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Options 4 & 5

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	\$569.23	\$569.23	\$569.23	\$569.23	\$2,276.92
Scanner	<u>\$6,481.32</u>	<u>\$8,602.48</u>	<u>\$8,602.48</u>	<u>\$8,602.48</u>	<u>\$8,602.48</u>	<u>\$40,891.24</u>
	\$6,481.32	\$9,171.71	\$9,171.71	\$9,171.71	\$9,171.71	\$43,168.16

NOTE: The scanner FY95 warranty is (90days) $\$8602.48 / 365 * 90 = \$2,121.16$.

9. TOTAL.

Options 1 & 2 Does not apply.

Option 3 Cell does not provide for a division between DS and GS maintenance.

Option 4 & 5 \$43,168.16 (Constant FY95\$)

COST DOCUMENT

1. HEADER.

SYSTEM: ORMP

DATE: 26 JULY 1994

ELEMENT TITLE: REPLENISHMENT DEPOT LEVEL REPARABLES (SPARES)

ELEMENT NUMBER: 5.03

2. ASSUMPTIONS.

a. Five year operational life of the COTS components.

b. Depot Repairable Parts Percentage (from paragraph 3.6.2.1).

Printer 1.385%

Scanner 2.77%

c. The unit costs are constant FY94 dollars.

d. The warranty costs are included as part of the COTS unit cost. The printer warranty is one year. The scanner warranty is 90 days.

3. INCLUSION/EXCLUSION CRITERIA.

a. This element includes the O&M costs of purchasing reparable required to resupply initial stockage. It also includes the reparable individual parts, assemblies, or sub-assemblies required on a recurring basis for the repair of major end items of equipment subsequent to fielding.

b. This element excludes depot material parts.

4. DATA SOURCE AND DATA ADJUSTMENTS.

a. Inflation - AMC Inflation Guidance dated 7 Feb 94.

b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.

c. Percent Replenished - See 3.6.2.1.

d. Unit Costs - Mr. Steve Hollandsworth, Engineer, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

a. Equation:

$$\begin{aligned} & \text{Unit Cost} * \\ & \text{Depot Repairable Parts Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Depot Repairable Parts} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Printer

$$\begin{aligned} & \$9,995.00 \text{ Unit Cost} * \\ & 0.01385 \text{ Depot Repairable Parts Percentage} * \\ & 1.028 \text{ Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$284.61 \text{ Annual Cost of Printer Depot Repairable Parts} \end{aligned}$$

Scanner

\$75,525.00 Unit Cost *
 0.0277 Depot Reparable Parts Percentage *
 1.028 Inflation Factor *
 2 Systems =
 \$4,301.24 Annual Cost of Scanner Depot Reparable Parts

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Option 1 & 2

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	Initial Stock	\$284.61	\$284.61	\$284.61	\$853.83
Scanner	Warranty ^	Initial Stock				
	<u>Initial Stock</u>	<u>\$3,240.66</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$16,144.38</u>
		\$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21

^ Note: Scanner FY95 warranty is (90 days) $\$4,301.24 / 365 * 90 = \$1,060.58$.

Option 4 & 5

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	\$284.61	\$284.61	\$284.61	\$284.61	\$1,138.44
Scanner	<u>\$3,240.66^</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$20,445.62</u>
	\$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06

^ Note: Scanner FY95 warranty is (90 days) $\$4,301.24 / 365 * 90 = \$1,060.58$.

9. TOTAL.

Option 1 & 2 \$16,998.20 (Constant FY95\$)

Option 3 This cell does not provide a division between DS and GS.

Option 4 & 5 \$21,584.05 (Constant FY95\$)

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP
ELEMENT TITLE: REPLENISHMENT CONSUMABLES

DATE: 26 JULY 1994
ELEMENT NUMBER: 5.04

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. Consumable Parts Percentage (from paragraph 3.6.2.1).
Printer 1.385%
Scanner 2.77%
- c. The unit costs are constant FY94 dollars.
- d. The warranty costs are included as part of the COTS unit cost. The printer warranty is one year. The scanner warranty is 90 days.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the O&M costs of purchasing consumables required to resupply initial stockage. It also includes the consumable (non-reparable) individual parts, assemblies, or sub-assemblies required on a recurring basis for the repair of major end items of equipment subsequent to fielding.
- b. This element excludes depot material parts.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Percent Replenished - See 3.6.2.1.
- d. Unit Costs - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Unit Cost} * \\ & \text{Consumable Parts Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Consumable Parts} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Printer

$$\begin{aligned} & \$9,995.00 \text{ Unit Cost} * \\ & 0.01385 \text{ Consumable Parts Percentage} * \\ & 1.028 \text{ Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$284.61 \text{ Annual Cost of Printer Consumable Parts} \end{aligned}$$

Scanner

\$75,525.00 Unit Cost *
 0.0277 Consumable Parts Percentage *
 1.028 Inflation Factor *
 2 Systems =
 \$4,301.24 Annual Cost of Scanner Consumable Parts

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Option 1 & 2

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	Initial Stock	\$284.61	\$284.61	\$284.61	\$853.83
Scanner	Warranty ^	Initial Stock				
	<u>Initial Stock</u>	<u>\$3,240.66</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$16,144.38</u>
	\$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21

^ Note: Scanner FY95 warranty is (90 days) $\$4,301.24 / 365 * 90 = 1,060.58$.

Option 4 & 5

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	\$284.61	\$284.61	\$284.61	\$284.61	\$1,138.44
Scanner	<u>\$3,240.66^</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$4,301.24</u>	<u>\$20,445.62</u>
	\$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06

^ Note: Scanner FY95 warranty is (90 days) $\$4,301.24 / 365 * 90 = \$1,060.58$.

9. TOTAL.

Option 1 & 2 \$16,998.21 (Constant FY95\$)

Option 3 This cell does not provide a division between DS and GS.

Option 4 & 5 \$21,584.06 (Constant FY95\$)

COST DOCUMENT

1. HEADER.

SYSTEM: ORMP
ELEMENT TITLE: OVERHAUL (P7M)

DATE: 26 JULY 1994
ELEMENT NUMBER: 5.061

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. The unit costs are constant FY94 dollars.
- c. The warranty costs are included as part of the COTS unit cost. The printer warranty is one year. The scanner warranty is 90 days.
- d. Depot Material Parts (from paragraph 3.6.2.1).
 - Printer 0.53%
 - Scanner 1.06%
- e. Depot Labor/Management (from paragraph 3.6.2.1).
 - Printer 0.53%
 - Scanner 1.06%

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the costs of material, labor, and overhead for the repair/overhaul of the basic end item and components. The material, labor, and overhead costs for the contractor performed depot overhaul are also included in this element.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Percent Replenished - See 3.6.2.1.
- d. Unit Costs - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.
- e. Annual Operating Hours - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.
- f. Mean Time Between Failure Rates:
 - (1) Printer - Mr. Howard Cullum, Hewlett Packard
 - (2) Scanner - Mr. Robert Bornhofen, Tangent Engineering
- g. Mean Time To Repair
 - (1) Printer - Mr. Howard Cullum, Hewlett Packard
 - (2) Scanner - Mr. Robert Bornhofen, Tangent Engineering
- h. Depot Maintenance Labor Rate per Hour - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- i. Unit Costs - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

a. Printer Depot Material Parts Equation (for Organic or CLS):

$$\begin{aligned} & \text{Printer Unit Cost} * \\ & \text{Printer Depot Material Parts Percentage} * \\ & \text{Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Printer Depot Material Parts} \end{aligned}$$

b. Scanner Depot Material Parts Equation (for Organic or CLS):

$$\begin{aligned} & \text{Scanner Unit Cost} * \\ & \text{Scanner Depot Material Parts Percentage} * \\ & \text{Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Scanner Depot Material Parts} \end{aligned}$$

c. Printer Depot Labor/Management Equation (for Organic):

$$\begin{aligned} & \text{Printer Annual Operating Hours} / \\ & \text{Printer MTBF} * \\ & \text{Printer MTTR} * \\ & \text{Depot Labor/Management Rate} * \\ & \text{Constant FY95 Inflation Rate} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Organic Printer Depot Labor/Management} \end{aligned}$$

d. Scanner Depot Labor/Management Equation (for Organic):

$$\begin{aligned} & \text{Scanner Annual Operating Hours} / \\ & \text{Scanner MTBF} * \\ & \text{Scanner MTTR} * \\ & \text{Depot Labor/Management Rate} * \\ & \text{Constant FY95 Inflation Rate} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of Organic Scanner Depot Labor/Management} \end{aligned}$$

e. Printer Depot Labor/Management Equation (for CLS):

$$\begin{aligned} & \text{Printer Unit Cost} * \\ & \text{Printer Depot Labor/Management Percentage} * \\ & \text{Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of CLS Printer Depot Labor/Management} \end{aligned}$$

f. Scanner Depot Labor/Management Equation (for CLS):

$$\begin{aligned} & \text{Scanner Unit Cost} * \\ & \text{Scanner Depot Labor/Management Percentage} * \\ & \text{Constant FY95 Inflation Factor} * \\ & \text{Number of Systems} = \\ & \text{Annual Cost of CLS Scanner Depot Labor/Management} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

a. Printer Depot Material Parts Equation (for Organic or CLS):

$$\begin{aligned} & \$9,995.00 \text{ Printer Unit Cost} * \\ & 0.0053 \text{ Printer Depot Material Parts Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$108.91 \text{ Annual Cost of Printer Depot Material Parts} \end{aligned}$$

b. Scanner Depot Material Parts Equation (for Organic or CLS):

$$\begin{aligned} & \$75,525.00 \text{ Scanner Unit Cost} * \\ & 0.0106 \text{ Scanner Depot Material Parts Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$1,645.96 \text{ Annual Cost of Scanner Depot Material Parts} \end{aligned}$$

c. Printer Depot Labor/Management Equation (for Organic):

$$\begin{aligned} & 2080 \text{ Printer Annual Operating Hours} / \\ & 3120 \text{ Printer MTBF} * \\ & 2 \text{ Printer MTTR} * \\ & \$52.00 \text{ Depot Labor/Management Rate} * \\ & 1.028 \text{ Constant FY95 Inflation Rate} * \\ & 2 \text{ Systems} = \\ & \$142.55 \text{ Annual Cost of Organic Printer Depot Labor/Management} \end{aligned}$$

d. Scanner Depot Labor/Management Equation (for Organic):

$$\begin{aligned} & 2080 \text{ Scanner Annual Operating Hours} / \\ & 900 \text{ Scanner MTBF} * \\ & 0.25 \text{ Scanner MTTR} * \\ & \$52.00 \text{ Depot Labor/Management Rate} * \\ & 1.028 \text{ Constant FY95 Inflation Rate} * \\ & 2 \text{ Systems} = \\ & \$61.77 \text{ Annual Cost of Organic Scanner Depot Labor/Management} \end{aligned}$$

e. Printer Depot Labor/Management Equation (for CLS):

$$\begin{aligned} & \$9,995.00 \text{ Printer Unit Cost} * \\ & 0.0053 \text{ Printer Depot Labor/Management Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$108.91 \text{ Annual Cost of CLS Printer Depot Labor/Management} \end{aligned}$$

f. Scanner Depot Labor/Management Equation (for CLS):

$$\begin{aligned} & \$75,525.00 \text{ Scanner Unit Cost} * \\ & 0.0106 \text{ Scanner Depot Labor/Management Percentage} * \\ & 1.028 \text{ Constant FY95 Inflation Factor} * \\ & 2 \text{ Systems} = \\ & \$1,645.96 \text{ Annual Cost of CLS Scanner Depot Labor/Management} \end{aligned}$$

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

These results are from the "Methodology Calculations" and where summed as follows:

Option 1 Printer (6.a) + (6.c)

Option 1 Scanner (6.b) + (6.d)

Option 2 Printer (6.a) + (6.e)

Option 2 Scanner (6.b) + (6.f)

Option 1 (Organic)

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	Total
Printer	Warranty	Initial Stock	\$251.46	\$251.46	\$251.46	\$754.38
Scanner	Warranty ^	Initial Stock				
	<u>Initial Stock</u>	<u>\$1,286.65</u>	<u>\$1,707.73</u>	<u>\$1,707.73</u>	<u>\$1,707.73</u>	<u>\$6,409.84</u>
		\$1,286.65	\$1,959.19	\$1,959.19	\$1,959.19	\$7,164.22

^ Note: Scanner FY95 warranty is (90 days) $\$1,707.73 / 365 * 90 = \421.08 .

Option 2 (CLS)

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	Total
Printer	Warranty	\$217.82	\$217.82	\$217.82	\$217.82	\$871.28
Scanner	<u>\$2,480.21</u> ^	<u>\$3,291.92</u>	<u>\$3,291.92</u>	<u>\$3,291.92</u>	<u>\$3,291.92</u>	<u>\$15,647.89</u>
	\$2,480.21	\$3,509.74	\$3,509.74	\$3,509.74	\$3,509.74	\$16,519.17

^ Note: Scanner FY95 warranty is (90 days) $\$3,291.92 / 365 * 90 = \811.71 .

9. TOTAL.

Option 1 (ORGANIC) \$7,164.22 (Constant FY95\$)

Option 2 (CLS) \$16,519.17 (Constant FY95\$)

Option 3 Since it is unknown how a division would occur between DS and GS for Option 3, it is also unknown whether to include this cell as a separate CLS cost or exclude this cell because the costs are included in a maintenance agreement.

Option 4 & 5 Cell does not apply to Options 4 and 5 because the costs are included in the maintenance agreement.

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP
ELEMENT TITLE: TRANSPORTATION

DATE: 26 JULY 1994
ELEMENT NUMBER: 5.07

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. Depot Reparable Parts Percentage (from paragraph 3.6.2.1)
Printer 1.385%
Scanner 2.77%
- c. The costs are current FY94 dollars.
- d. The warranty costs are included as part of the COTS unit cost. The printer warranty is one year. The scanner warranty is 90 days.
- e. The transportation costs will be the same between CLS and Organic because the same item weights between CLS and Organic will be transported to/from the comparative locations. The comparative locations are Fort Hood TX. and Germany with the Fort Washington PA. area used as the return point.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the O&M funded costs of transporting items to depot maintenance facilities and back to the operational units.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Unit Costs - Mr. Steve Hollandsworth, U.S. Army Topographic Engineering Center.
- d. Number of Systems and Location - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- e. Shipping Cost per Pound - Ms. Jones, United Parcel Service.
- f. Printer Weight - Mr. Howard Cullum, Hewlett Packard.
- g. Scanner Weight - Mr. Robert Bornhofen, Tangent Engineering.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Component Weight} * \\ & \text{Depot Reparable Parts Percentage} * \\ & (\text{Annual Operating Hours} / \text{MTBF}) * \\ & \text{Transportation Cost per Pound} * \\ & \text{Constant FY95 Inflation Factor} = \\ & \text{Annual Cost of Reparable Item Transportation} \end{aligned}$$

$$\begin{aligned} & \text{Printer (CONUS)} + \text{Printer (OCONUS)} = \text{Printer Annual Transportation} \\ & \text{Scanner (CONUS)} + \text{Scanner (OCONUS)} = \text{Scanner Annual Transportation} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

a. Printer CONUS

155 Component Weight *
0.01385 Depot Repairable Parts Percentage *
2080 / 3120 (Annual Operating Hours / MTBF) *
\$0.38 Transportation Cost per Pound *
1.028 Constant FY95 Inflation Factor =
\$0.56 Annual Cost of Repairable Item Transportation

b. Scanner CONUS

200 Component Weight *
0.0277 Depot Repairable Parts Percentage *
2080 / 900 (Annual Operating Hours / MTBF) *
\$0.38 Transportation Cost per Pound *
1.028 Constant FY95 Inflation Factor =
\$5.00 Annual Cost of Repairable Item Transportation

c. Printer OCONUS

155 Component Weight *
0.01385 Depot Repairable Parts Percentage *
2080 / 3120 (Annual Operating Hours / MTBF) *
\$3.54 Transportation Cost per Pound *
1.028 Constant FY95 Inflation Factor =
\$5.21 Annual Cost of Repairable Item Transportation

d. Scanner OCONUS

200 Component Weight *
0.0277 Depot Repairable Parts Percentage *
2080 / 900 (Annual Operating Hours / MTBF) *
\$3.54 Transportation Cost per Pound *
1.028 Constant FY95 Inflation Factor =
\$46.59 Annual Cost of Repairable Item Transportation

\$0.56 Printer (CONUS) + \$5.21 Printer (OCONUS) = \$5.77 Printer Annual Transportation
\$5.00 Scanner (CONUS) + \$46.59 Scanner (OCONUS) = \$51.59 Scanner Annual Transportation

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Option 1-5

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
Printer	Warranty	\$5.77	\$5.77	\$5.77	\$5.77	\$23.08
Scanner	<u>\$38.73</u> ^	<u>\$51.59</u>	<u>\$51.59</u>	<u>\$51.59</u>	<u>\$51.59</u>	<u>\$245.09</u>
	\$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17

^ Note: Scanner FY95 warranty is (90 days) $\$51.59 / 365 * 90 = \12.86 .

9. TOTAL.

Options 1-5 \$268.17 (Constant FY95\$)

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP

DATE: 26 JULY 1994

ELEMENT TITLE: PROJECT MANAGEMENT ADMINISTRATION (PM CIV)

ELEMENT NUMBER: 5.101

2. ASSUMPTIONS.

- a. Government Salaries are Current 94\$.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the O&M-funded costs of the PM office (Not Funded By the RDT&E, or Procurement) for system engineering and technical control, as well as the business management of the system/program.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Grade Levels and Percent Time Dedicated to QRMP - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- d. Annual Salaries - Selective Federal White Collar Pay Schedules, effective 1 January 1994 - 31 December 1995.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} & \text{Number of Persons} * \\ & \text{Annual Salary} * \\ & \text{Percent of Time Dedicated} = \\ & \text{Annual Cost of Person} \\ \\ & \text{Sum Annual Cost of Persons} * \\ & \text{Constant FY95 OMA Inflation Factor} = \\ & \text{Annual System Project Management (Constant FY95\$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

<u>GRADE LEVEL</u>	<u># PERSONS</u>	<u>ANNUAL SALARY</u>	<u>TIME DEDICATED</u>	<u>TOTAL</u>
GS12	1	\$45,670.00	50%	\$22,835.00
GS13	3	\$54,308.00	50%	\$81,462.00
GS13	1	\$54,308.00	10%	\$ 5,430.80
GS15	1	\$75,489.00	10%	<u>\$ 7,548.90</u>
				\$117,276.70

\$117,276.70 Sum Annual Cost of Persons *
1.028 Constant FY95 OMA Inflation Factor =
\$120,560.45 Annual System Project Management (Constant FY95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Options 1 - 5

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25

9. TOTAL.

Options 1 - 5 \$602,802.25 (Constant FY95\$)

COST DOCUMENT

1. HEADER.

SYSTEM: QRMP
ELEMENT TITLE: TRAINING

DATE: 26 JULY 1994
ELEMENT NUMBER: 5.11

2. ASSUMPTIONS.

- a. Five year operational life of the COTS components.
- b. The 29J E4 OMA Replacement Training Cost is \$11,200.00 (Current 93\$).
- c. The 29J E5 OMA Replacement Training Cost is \$11,200.00 (Current 93\$).
- d. The Average Replacement Training Cost is \$11,200.00 (Current 93\$).
- e. $\$11,200.00 * (1.028 \text{ OMA Inflation Factor}) = \$11,513.60 \text{ (Constant 95\$)}$.
- f. $\$1805.00 \text{ Recruit Assention and Separation Cost (Current 93\$)} * 1.028 \text{ OMA Inflation Factor} = \$1,855.54 \text{ (Constant 95\$)}$.

3. INCLUSION/EXCLUSION CRITERIA.

- a. This element includes the O&M funded costs of system specific individual training for replacement personnel. The training can include the specific course taught in a TRADOC school and/or transition training for qualifying the replacement personnel.
- b. This element excludes the MP costs associated with the instructors and students, and the procurement costs for training ammunition.

4. DATA SOURCE AND DATA ADJUSTMENTS.

- a. Inflation - AMC Inflation Guidance dated 7 Feb 94.
- b. Operational Life - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.
- c. Replacement Training Cost - AMCOS MODEL, Version 7.0, Dated June 93.
- d. Annual Attrition Rate - Army Force Planning Cost Handbook, June 93.
- e. Annual Maintenance Ratio - Cell 4.02.
- f. Number of QRMPs - Ms. Rose Acheson, U.S. Army Topographic Engineering Center.

5. COST EXPRESSION.

- a. Equation:

$$\begin{aligned} &\text{Annual Maintainer Replacement Training cost} + \\ &\quad \text{Recruit Assention and Separation cost} * \\ &\quad \quad \text{Annual Maintenance Ratio} * \\ &\quad \quad \quad \text{Number of Systems} * \\ &\quad \quad \quad \text{Annual Attrition Rate} = \\ &\text{Annual Cost of Training (Constant FY95\$)} \end{aligned}$$

6. METHODOLOGY CALCULATIONS.

Option 1 & 2

\$11,513.60 Average Replacement Training Cost +
\$1,855.54 Recruit Assention and Separation Cost *
0.28 Annual Maintenance Ratio *
2 Systems *
1.219 Annual Attrition Rate =
\$9,126.31 Annual Cost of Training (Constant FY95\$)

Option 3

\$11,513.60 Average Replacement Training Cost +
\$1,855.54 Recruit Ascension and Separation Cost *
0.22 Annual Maintenance Ratio *
2 Systems *
1.219 Annual Attrition Rate =
\$7,170.67 Annual Cost of Training (Constant FY95\$)

Option 4

\$11,513.60 Average Replacement Training Cost +
\$1,855.54 Recruit Ascension and Separation Cost *
0.15 Annual Maintenance Ratio *
2 Systems *
1.219 Annual Attrition Rate =
\$4,889.09 Annual Cost of Training (Constant FY95\$)

7. LIMITATIONS OF ESTIMATE.

a. None

8. RESULTS (Constant FY95 Dollars).

Option 1 & 2

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$45,631.55

Option 3

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
\$7,170.67	\$7,170.67	\$7,170.67	\$7,170.67	\$7,170.67	\$35,853.35

Option 4

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>Total</u>
\$4,889.09	\$4,889.09	\$4,889.09	\$4,889.09	\$4,889.09	\$24,445.45

9. TOTAL.

Option 1 & 2 \$45,631.55 (Constant 95\$)

Option 3 \$35,853.35 (Constant 95\$)

Option 4 \$24,445.45 (Constant 95\$)

Option 5 Does not apply

COST SUMMARY

1. HEADER.

SYSTEM: QRMP

DATE: 26 July 1994

SUMMARY ELEMENT TITLE: Option 1

<u>ELEMENT NO.</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>TOTAL</u>
2.11	\$368.16	\$368.16	\$368.16	\$368.16	\$368.16	\$1,840.80
4.02	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$90,747.30
4.051	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$54,580.25
5.01	Does not apply to Option 1					\$ 0.00
5.03	Warranty Initial Stock	Initial Stock \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21
5.04	Warranty Initial Stock	Initial Stock \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21
5.061	Warranty Initial Stock	Initial Stock \$1,286.65	\$1,959.19	\$1,959.19	\$1,959.19	\$7,164.22
5.07	Warranty \$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17
5.101	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25
5.11	\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$45,631.55

Total Life Cost Option 1 = \$837,030.96

COST SUMMARY

1. HEADER.

SYSTEM: ORMP

DATE: 26 July 1994

SUMMARY ELEMENT TITLE: Option 2

<u>ELEMENT NO.</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>TOTAL</u>
2.11	\$368.16	\$368.16	\$368.16	\$368.16	\$368.16	\$1,840.80
4.02	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$18,149.46	\$90,747.30
4.051	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$10,916.05	\$54,580.25
5.01	Does not apply to Option 2					\$ 0.00
5.03	Warranty Initial Stock	Initial Stock \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21
5.04	Warranty Initial Stock	Initial Stock \$3,240.60	\$4,585.85	\$4,585.85	\$4,585.85	\$16,998.21
5.061	Warranty \$2,480.21	\$3,509.74	\$3,509.74	\$3,509.74	\$3,509.74	\$16,519.17
5.07	Warranty \$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17
5.101	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25
5.11	\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$9,126.31	\$45,631.55

Total Life Cost Option 2 = \$846,385.91

COST SUMMARY

1. HEADER.

SYSTEM: ORMP

DATE: 26 July 1994

SUMMARY ELEMENT TITLE: Option 3

<u>ELEMENT NO.</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>TOTAL</u>
2.11	\$289.27	\$289.27	\$289.27	\$289.27	\$289.27	\$1,446.35
4.02	\$14,260.29	\$14,260.29	\$14,260.29	\$14,260.29	\$14,260.29	\$71,301.45
4.051	\$8,576.89	\$8,576.89	\$8,576.89	\$8,576.89	\$8,576.89	\$42,884.45
5.01	(This Cell does not provide a division between DS and GS)					
5.03	(This Cell does not provide a division between DS and GS)					
5.04	(This Cell does not provide a division between DS and GS)					
5.061	Does not apply to Option 3					\$ 0.00
5.07	Warranty \$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17
5.101	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25
5.11	\$7,170.67	\$7,170.67	\$7,170.67	\$7,170.67	\$7,170.67	\$35,853.35

Total Life Cost Option 3 = \$ UNKNOWN

COST SUMMARY

1. HEADER.

SYSTEM: ORMP DATE: 26 July 1994
SUMMARY ELEMENT TITLE: Option 4

<u>ELEMENT NO.</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>TOTAL</u>
2.11	\$197.23	\$197.23	\$197.23	\$197.23	\$197.23	\$986.15
4.02	\$9,722.93	\$9,722.93	\$9,722.93	\$9,722.93	\$9,722.93	\$48,614.65
4.051	\$5,847.88	\$5,847.88	\$5,847.88	\$5,847.88	\$5,847.88	\$29,239.41
5.01	Warranty \$6,481.32	\$9,171.71	\$9,171.71	\$9,171.71	\$9,171.71	\$43,168.16
5.03	Warranty \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06
5.04	Warranty \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06
5.061	Does not apply to Option 4					\$ 0.00
5.07	Warranty \$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17
5.101	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25
5.11	\$4,889.09	\$4,889.09	\$4,889.09	\$4,889.09	\$4,889.09	\$24,445.45

Total Life Cost Option 4 = \$792,692.36

COST SUMMARY

1. HEADER.

SYSTEM: QRMP DATE: 26 July 1994
 SUMMARY ELEMENT TITLE: Option 5

<u>ELEMENT NO.</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>TOTAL</u>
2.11		Does not apply to Option 5				\$ 0.00
4.02		Does not apply to Option 5				\$ 0.00
4.051		Does not apply to Option 5				\$ 0.00
5.01	Warranty \$6,481.32	\$9,171.71	\$9,171.71	\$9,171.71	\$9,171.71	\$43,168.16
5.03	Warranty \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06
5.04	Warranty \$3,240.66	\$4,585.85	\$4,585.85	\$4,585.85	\$4,585.85	\$21,584.06
5.061		Does not apply to Option 5				\$ 0.00
5.07	Warranty \$38.73	\$57.36	\$57.36	\$57.36	\$57.36	\$268.17
5.101	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$120,560.45	\$602,802.25
5.11		Does not apply to Option 5				\$ 0.00

Total Life Cost Option 5 = \$689,406.70

	Option 1	Option 2	Option 3	Option 4	Option 5	
	Organic	CLS	CLS	CLS	CLS	Depot Support
	Organic	Organic	CLS	CLS	CLS	General Support
	Organic	Organic	Organic	CLS	CLS	Direct Support
	Organic	Organic	Organic	Organic	CLS	Unit Support
	2.11	2.11	2.11	2.11		Training Ammunition/Missiles
	4.02	4.02	4.02	4.02		Maintenance (MTOE)
	4.051	4.051	4.051	4.051		Training (MP Funded)
			5.01	5.01	5.01	Field Maintenance Civilian Labor
	5.03	5.03	5.03	5.03	5.03	Replenish Depot Level Reparables
	5.04	5.04	5.04	5.04	5.04	Replenishment Consumables
	5.061	5.061				Overhaul (P7M)
	5.07	5.07	5.07	5.07	5.07	Transportation
	5.101	5.101	5.101	5.101	5.101	Project Management Administration
	5.11	5.11	5.11	5.11		Training (O&M Funded)
Total Opt1	\$837,030					
Total Opt2		\$846,385				
Total Opt3			Unknown			
Total Opt4				\$792,692		
Total Opt5					\$689,406	

Table 2.0 QRMP Maintenance Option Total Costs

4.0 Conclusions

Table 2.0 shows the most cost effective maintenance solution to be Option 5, Total CLS by approximately \$31K per year or \$157K over five years. However, for the QRMP to be an effective tool for the battlefield commander, the QRMP must be supported on the battlefield. The Army will be risking battlefield support if CLS is chosen to provide direct maintenance support for the QRMP.

Army maintenance policy requires the use of organic maintenance for equipment issued to TOE units.

Because of the constant changes in technology for information processing equipment and original equipment manufacturers are providing the repair of components, it is cost prohibitive for organic maintenance to provide depot-level repair for depot-level reparable.

Organic maintenance provides the best support to units that are subject to movement during field training and possible deployment to areas of conflict. The Army has the qualified and skilled electronics maintainers necessary to maintain the QRMP. As the Army progresses towards the digital battlefield concept, these maintainers will become more prevalent.

5.0 Recommendations

- a. A contractor should provide Interim Contractor Support until organic maintenance is implemented..
- b. Implementation of the maintenance support consisting of:
 - (1) Unit-level maintenance consisting solely of operator/crew PMCS performed by the 81-Q MOS,
 - (2) Direct support maintenance performed by the 29-J (35-J) MOS, and
 - (3) Depot support consisting of:
 - (a) Depot repair of COTS reparable components performed by the COTS manufacturers,
 - (b) Depot repair of the overall system and supply functions by the nominated organic depot (i.e. Tobyhanna).
- c. The 29-J (35-J) MOS be familiarized or trained to repair the CHS-II equipment and applicable DTSS equipment.

6.0 Bibliography.

ANSI Z39.18 Scientific and Technical Reports - Organization, Preparation, and Production, March 1987

AR 611-201 Military Occupational Classification and Structure, October 1990

AR 750-1 Army Material Maintenance Policies, November 1992

DoD 3235.1-H Test & Evaluation of System Reliability, Availability, and Maintainability, March 1982

Pam 70-2 AMC/TRADOC, Material Acquisition Handbook, 1987

QRMP Acquisition Plan, March 1992

QRMP Integrated Logistics Support Plan, March 1990

QRMP Operational Requirements Document, Not Dated, (Formerly, the Required Operational Capability)

SD-2 Buying NDI, October 1990

TOE 5-335 Table of Organization and Equipment (TOE) for Engineer Topographic Battalion

U.S. Army Cost Analysis Manual, August 1992, from U.S. Army Cost and Economic Analysis Center